ACTIVITY # 3 Nuclear Chemistry

REMARKS

INTRODUCTION

You are going to explore the concept of a half-life with some radioactive M&Ms. The "M" side of the M&M is radioactive, while the blank side of the M&M is considered non-radioactive.

PROCEDURE

1. Obtain a bag of M&Ms and record the exact number of M&Ms.
2. Shake your bag and pour out the M&Ms. DO NOT turn any over. This represents the passing of a decay period: a half-life. Remove all the non- radioactive M&Ms.
3. Count the number of radioactive M&Ms remaining. Record this value for decay period 1. Place the radioactive M&Ms back in the bag.
4. Shake the bag again and pour out the M&Ms. This represents a second decay period.
5. Remove the non-radioactive M&Ms, count the radioactive M&Ms and record the value.
6. Repeat these steps and fill out the table below. A data table will be on the board for the data of the entire class. Record the class average in your data table.
7. Plot your results for percent of radioactive M&Ms and the class average percent of radioactive M&Ms.

OBSERVATION

Decay Periods	Number of Radioactive M&Ms	Percent of Radioactive M&Ms	Class average % Radioactive M&Ms
0 (starting)			
1			
2			
3			
4			
5			

QUESTIONS

Part 1. Answer the following questions based on the activity above.

1. Approximately what percent of the M&Ms became non-radioactive during each decay period?
2. Based on that calculation, how many M&Ms will be radioactive after 7 decay periods?
3. Explain what this decay pattern means in your own words.

Part 2

1. Radioactive Reindeer In the aftermath of the Chernobyl nuclear reactor disaster, radioactive fallout carried by wind and rain contaminated large areas of Scandinavia. Plants absorbed $_{137}$Cs and other radioactive isotopes from the soil and water. In turn, the reindeer population in the area became contaminated with $_{137}$Cs from eating the radioactive plants. The half-life of 137Cs is 30 years.

Assume that no additional $_{137}Cs$ is absorbed by the soil in the area. If the reindeer meat will be deemed safe to eat when the plants and soil in the area only have 15% of the original levels of radioactive $_{137}Cs$, how much time must pass before it will be safe to eat reindeer meat again? Explain.

2. Look at the radioactivity data for the following cities from 1986. Assume the average half-life of this radioactive material is 25 years. Approximately what year will it be when the radiation levels fall below 5 Curies/km2?

City	Dobrush, Belarus	Chernobyl, Ukraine	Mazyr, Belarus
Radiation level 1986	15 Ci/km^2	40 Ci/km^2	7 Ci/km^2
Year when levels below 5 Ci/km2			

REFERENCES

J Younker and S Boesdorfer for the UIUC GK-12 program